Here are 50 multiple-choice questions (MCQs) based on **Unit VI: Sequential Logic Circuits** from your syllabus, along

1. What is an SR latch?

A) A synchronous flip-flop
B) An asynchronous flip-flop
C) A type of counter
D) A shift register

Answer: B
Explanation: An SR latch is an asynchronous flip-flop that operates based on the state of its inputs without the need fo

2. What is the main function of a flip-flop?

A) Addition and subtraction
B) Signal amplification
C) Data storage
D) Voltage regulation

Answer: C
Explanation: Flip-flops are used as basic memory elements for data storage.

3. In a D flip-flop, what does the 'D' stand for?

A) Data
B) Delay
C) Digital
D) Decade

Answer: A
Explanation: The 'D' in D flip-flop stands for "Data," as it transfers the input data to the output on a clock edge.

4. Which flip-flop is called a “toggle” flip-flop?

A) SR flip-flop
B) JK flip-flop

C) T flip-flop
D) D flip-flop

Answer: C
Explanation: A T flip-flop toggles its output on every clock pulse when the input is high.

5. What is the purpose of a master-slave flip-flop?

A) Increase processing speed
B) Eliminate race conditions
C) Minimize power consumption
D) Add complexity to circuits

Answer: B
Explanation: Master-slave flip-flops prevent race conditions by using two stages of flip-flops.

6. What is the key characteristic of a JK flip-flop?

A) It has no clock input.
B) It avoids invalid states like SR flip-flops.
C) It can only operate synchronously.
D) It is used for counting only.

Answer: B
Explanation: JK flip-flops overcome the invalid state problem of SR flip-flops by toggling the output when both inputs a

7. What type of shift register shifts data in both directions?

A) Parallel-in, Parallel-out
B) Serial-in, Parallel-out
C) Serial-in, Serial-out
D) Bidirectional shift register

Answer: D
Explanation: A bidirectional shift register allows data to be shifted both left and right.

8. Which IC is commonly used for designing decade counters?

A) IC 7400
B) IC 7490
C) IC 555
D) IC 74138

Answer: B
Explanation: IC 7490 is a popular decade counter IC.

9. What is the modulus of a decade counter?

A) 8
B) 10
C) 16
D) 12

Answer: B
Explanation: A decade counter counts 10 states, hence its modulus is 10.

10. What type of counter is a ring counter?

A) Asynchronous counter
B) Synchronous counter
C) Serial counter
D) Static counter

Answer: B
Explanation: A ring counter is a synchronous counter where the output of the last flip-flop is fed back to the first.

11. How many flip-flops are required for a mod-16 counter?

A) 3
B) 4
C) 5
D) 6

Answer: B

Explanation: For a mod-16 counter, 2n=162^n = 16, so n=4n = 4 flip-flops are needed.

12. What is the output frequency of a 4-bit counter if the input clock frequency is 16 kHz?

A) 1 kHz
B) 2 kHz
C) 4 kHz
D) 8 kHz

Answer: A
Explanation: For a 4-bit counter, the output frequency is the input frequency divided by 24=162^4 = 16. 16 kHz/16=1

13. What does “asynchronous” in counters imply?

A) All flip-flops share the same clock.
B) Flip-flops are clocked one after another.
C) Counters cannot count.
D) Outputs are always high.

Answer: B
Explanation: In asynchronous counters, flip-flops are triggered one after another by the output of the previous flip-flop

14. Which counter uses T flip-flops?

A) Decade counter
B) Ring counter
C) Ripple counter
D) Synchronous counter

Answer: C
Explanation: Ripple counters use T flip-flops due to their toggling nature.

15. How many states does a Johnson counter have if it uses 4 flip-flops?

A) 4
B) 8

C) 12
D) 16

Answer: B
Explanation: A Johnson counter with 4 flip-flops has 2n=82n = 8 states.

16. Which sequential circuit is used for counting pulses?

A) Shift register
B) Flip-flop
C) Counter
D) Multiplexer

Answer: C
Explanation: Counters are sequential circuits designed to count the number of pulses applied to their input.

17. What is the characteristic equation of a D flip-flop?

A) Qnext=Q+DQ_{next} = Q + D
B) Qnext=DQ_{next} = D
C) Qnext=QQ_{next} = Q
D) Qnext=D+Q¯Q_{next} = D + \overline{Q}

Answer: B
Explanation: The output of a D flip-flop directly follows the input, so Qnext=DQ_{next} = D.

18. What is the maximum modulus of a 3-bit counter?

A) 4
B) 8
C) 16
D) 32

Answer: B
Explanation: The maximum modulus of a counter is 2n2^n, where nn is the number of bits. For n=3n = 3, modulus = 8

19. In a JK flip-flop, what happens when both inputs (J and K) are 1?

A) No change
B) Reset
C) Toggle
D) Set

Answer: C
Explanation: When both J and K are 1, the JK flip-flop toggles its output.

20. How many flip-flops are required for a mod-12 counter?

A) 2
B) 3
C) 4
D) 5

Answer: C
Explanation: For a mod-12 counter, the nearest power of 2 is 24=162^4 = 16, so 4 flip-flops are required.

21. What is a shift register used for?

A) Arithmetic operations
B) Storing and transferring data
C) Signal amplification
D) Generating clock signals

Answer: B
Explanation: Shift registers store data temporarily and transfer it serially or in parallel.

22. What is the clock frequency division ratio in a T flip-flop?

A) 1:1
B) 2:1
C) 3:1
D) 4:1

Answer: B

Explanation: A T flip-flop divides the input clock frequency by 2.

23. What is the operation performed by a ring counter?

A) Addition
B) Rotation of a single high bit
C) Division
D) Toggle

Answer: B
Explanation: A ring counter cycles a single high bit through the flip-flops in a circular pattern.

24. Which counter design is prone to glitches due to propagation delays?

A) Synchronous counter
B) Asynchronous counter
C) Decade counter
D) Ring counter

Answer: B
Explanation: Asynchronous counters experience propagation delays as flip-flops do not share a common clock.

25. What is the function of an asynchronous reset in flip-flops?

A) Reset triggered by a clock edge
B) Reset triggered at any time
C) Reset delayed by the clock cycle
D) Reset based on feedback

Answer: B
Explanation: An asynchronous reset immediately resets the flip-flop without waiting for the clock signal.

26. In sequential circuits, what determines the next state?

A) Input only
B) Clock only

C) Current state and input
D) Output

Answer: C
Explanation: The next state of a sequential circuit is determined by the current state and the inputs.

27. How many states does a 5-bit Johnson counter have?

A) 5
B) 10
C) 15
D) 20

Answer: B
Explanation: The number of states in a Johnson counter is 2n2n, where nn is the number of flip-flops.

28. Which IC is used for designing a 4-bit synchronous counter?

A) IC 7476
B) IC 7493
C) IC 7483
D) IC 7408

Answer: B
Explanation: IC 7493 is commonly used for 4-bit counters.

29. What is a primary application of a ring counter?

A) Frequency division
B) Sequence generation
C) Voltage amplification
D) Logic simplification

Answer: B
Explanation: Ring counters are used for sequence generation in digital systems.

30. What is the output of a decade counter after 15 clock pulses?

A) 0
B) 1
C) 5
D) 6

Answer: C
Explanation: A decade counter resets after 10 pulses, so after 15 pulses, the output will be 15mod 10=515 \mod 10 =

31. What type of sequential circuit is used in digital clocks?

A) Shift registers
B) Counters
C) Multiplexers
D) Encoders

Answer: B
Explanation: Counters are used in digital clocks to count time intervals.

32. How does a synchronous counter differ from an asynchronous counter?

A) It uses a single clock signal for all flip-flops.
B) It does not use flip-flops.
C) It generates continuous outputs.
D) It does not count.

Answer: A
Explanation: In synchronous counters, all flip-flops are triggered simultaneously by a common clock.

33. How many flip-flops are needed for a mod-64 counter?

A) 5
B) 6
C) 7
D) 8

Answer: B

Explanation: For a mod-64 counter, 2n=642^n = 64, so n=6n = 6 flip-flops are required.

34. What is the function of a synchronous reset in flip-flops?

A) Reset occurs with the clock pulse.
B) Reset occurs immediately.
C) Reset occurs after a delay.
D) Reset occurs randomly.

Answer: A
Explanation: A synchronous reset resets the flip-flop only when a clock pulse is applied.

35. What is the role of the enable input in a flip-flop?

A) Amplifies the output
B) Controls whether the flip-flop operates
C) Generates clock pulses
D) Changes output logic levels

Answer: B
Explanation: The enable input controls whether the flip-flop responds to the input signals.

36. What is the key feature of a sequential circuit compared to a combinational circuit?

A) Outputs depend only on inputs
B) Outputs depend on inputs and the current state
C) No use of flip-flops
D) It only performs arithmetic operations

Answer: B
Explanation: Sequential circuits depend on the present state (stored in flip-flops) and current inputs to determine the

37. How is a decade counter different from a binary counter?

A) Counts up to 16 states
B) Counts up to 10 states

C) Has only one flip-flop
D) Does not require a clock signal

Answer: B
Explanation: A decade counter counts up to 10 states (0 to 9) before resetting to 0.

38. Which flip-flop is used to design a Johnson counter?

A) SR flip-flop
B) JK flip-flop
C) D flip-flop
D) T flip-flop

Answer: C
Explanation: Johnson counters are typically implemented using D flip-flops for predictable feedback.

39. What is the difference between a parallel load shift register and a serial load shift registe

A) Number of flip-flops used
B) Parallel load shifts data at once, while serial load shifts bit by bit
C) Clock speed
D) Type of feedback used

Answer: B
Explanation: Parallel load shifts all bits simultaneously, while serial load shifts data one bit at a time.

40. What is the advantage of synchronous counters over asynchronous counters?

A) Simplicity in design
B) High-speed operation
C) Reduced power consumption
D) Fewer flip-flops required

Answer: B
Explanation: Synchronous counters operate faster because all flip-flops are triggered simultaneously, avoiding delay

41. Which circuit can be used to divide a clock frequency by 4?

A) Ring counter with 4 flip-flops
B) T flip-flop with 2 stages
C) JK flip-flop configured in toggle mode with 2 stages
D) Any single flip-flop

Answer: C
Explanation: A chain of JK flip-flops in toggle mode divides the clock frequency by 2n2^n, where nn is the number of fl

42. In a JK flip-flop, what does the output depend on when both J and K are high?

A) Clock pulse
B) Current output state
C) Input data
D) Clock pulse and current output

Answer: D
Explanation: When both J and K are high, the JK flip-flop toggles its state on every clock pulse.

43. What is the role of shift registers in digital communication?

A) Perform arithmetic operations
B) Temporarily store data and convert between serial and parallel forms
C) Amplify data signals
D) Control counters

Answer: B
Explanation: Shift registers are crucial in communication for converting data formats (serial-to-parallel or parallel-to-

44. What is the modulus of a counter that uses 4 flip-flops but is reset after 12 states?

A) 16
B) 12
C) 8
D) 10

Answer: B

Explanation: A counter that resets after 12 states has a modulus of 12, even though 4 flip-flops allow up to 16 states.

45. Which circuit is an example of a sequential circuit?

A) Adder
B) Multiplexer
C) Counter
D) Decoder

Answer: C
Explanation: A counter is a sequential circuit as its output depends on the sequence of previous inputs and states.

46. What is the operation performed by an SR latch when both inputs (S and R) are 0?

A) Set output high
B) Set output low
C) Maintain the current state
D) Toggle the output

Answer: C
Explanation: When both S and R are 0, the SR latch remains in its current state.

47. What is the main disadvantage of asynchronous counters?

A) Increased complexity
B) High power consumption
C) Propagation delay
D) Need for multiple clocks

Answer: C
Explanation: Asynchronous counters suffer from propagation delays as each flip-flop triggers the next sequentially.

48. Which type of flip-flop is used in a binary counter?

A) SR flip-flop
B) JK flip-flop

C) T flip-flop
D) D flip-flop

Answer: C
Explanation: Binary counters commonly use T flip-flops due to their toggling behavior.

49. What happens in a shift register when a clock pulse is applied?

A) All data is erased
B) Data shifts by one position
C) The output is reset
D) The counter is incremented

Answer: B
Explanation: When a clock pulse is applied, a shift register shifts its stored data by one position.

50. What is the output state of a 4-bit ring counter initialized with 10001000 after 3 clock puls

A) 00010001
B) 00100010
C) 01000100
D) 10001000

Answer: A
Explanation: In a ring counter, the high bit shifts to the next flip-flop in a circular manner. After 3 pulses, the output wi